Title: Electronics and adsorption properties of model catalytic systems contains cerium

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Abstract:

The doctoral thesis contains the study of model catalyst systems based on cerium and ceria. The thesis deals with model systems of CeAg, CeO_2/Cu(111), Ni-CeO_2/Cu(111) a Ni-Sn-CeO_2/Cu(111). We have studied these systems using photoelectron spectroscopy, ion scattering spectroscopy and low energy electron diffraction. Model systems were prepared under strictly defined conditions.

The strong bimetallic interaction was observed on the CeAg layers. Molecular adsorption of carbon monoxide on CeAg was demonstrated. We also observed intensive reaction of these layers with oxygen.

By measurements in different directions of surface Brillouin zone, we managed to reconstruct the band structure of the prepared CeO_2/Cu(111) layer. We have shown that the Cu substrate interacts weakly with deposited CeO_2 layer. This interaction results in a charge transfer from Cu into CeO_2. Overall, in the valence spectrum we have identified three main electron bands corresponding to O *2p* state bound in CeO_2.

It has been proven that the deposition of Ni on CeO_2 layers leads to partial reduction of the surface. Strong interaction of Ni and Ce results in the formation of the mixed oxide Ni - O - Ce. Furthermore, interaction of Ni with Sn on Ni-Sn-CeO_2/Cu(111) surface results in reduction of SnO.

Understanding the interaction of the various components in the catalytic system and the ability to modify their electronic structure will enable the development of more selective, better and cheaper catalyst.

Keywords: XPS, UPS, Cu(111), CeO_2, Ag, Ni, Sn, catalysis